

State of California  
AIR RESOURCES BOARD

Research Resolutions

Research Division

June 22-23, 2000

## INTRODUCTION

Contained herein for Board review are resolutions and accompanying summaries to fund two projects from the Extramural Research Program recommended to the Board by the Research Screening Committee.

Item 1 is a research proposal from the University of California, Riverside, entitled, "Studies of the Atmospheric Chemistry of Volatile Organic Compounds and of their Atmospheric Reaction Products." The principal investigators will be Professor Roger Atkinson and Professor Janet Arey.

Resolution No. 00-24

Item 2 is a research proposal from San Diego State University Foundation, entitled, "Economic Value of Hospitalizations Associated with Particulate and Ozone Air Pollution." The principal investigator will be Dr. Mark Thayer.

Resolution No. 00-25

**PROPOSED****State of California  
AIR RESOURCES BOARD****RESEARCH PROPOSAL****Studies of the Atmospheric Chemistry of Volatile Organic Compounds and of their  
Atmospheric Reaction Products**

Resolution 00-24  
June 22, 2000

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2453-214, entitled "Studies of the Atmospheric Chemistry of Volatile Organic Compounds and of their Atmospheric Reaction Products," has been submitted by the University of California, Riverside;

**WHEREAS**, the Research Division staff have reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2453-214 entitled "Studies of the Atmospheric Chemistry of Volatile Organic Compounds and of their Atmospheric Reaction Products," submitted by the University of California, Riverside, for a total amount not to exceed \$299,987.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2453-214 entitled "Studies of the Atmospheric Chemistry of Volatile Organic Compounds and of their Atmospheric Reaction Products," submitted by the University of California, Riverside, for a total amount not to exceed \$299,987.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed \$299,987.

## **“Studies of the Atmospheric Chemistry of Volatile Organic Compounds and of their Atmospheric Reaction Products”**

### **Background**

Large quantities of volatile organic compounds (VOCs) are emitted into the atmosphere from anthropogenic sources. In the atmosphere, these compounds can react to form products, which usually undergo additional reactions. The reactions of VOCs and their subsequent products can lead to the formation of ozone, secondary organic aerosol (SOA), and toxic air contaminants, resulting in adverse effects on human health and visibility. While the reaction kinetics and mechanisms of the initial reactions of many VOCs are believed to be well understood, much less is known about the subsequent reactions of the products of the initial reactions. To understand the effect of an emitted compound on air quality, it is necessary to thoroughly understand the reactions of both the parent compound and its first and later generation products.

### **Objective**

The objective of this proposal is to investigate the reactions of selected first and later generation products. The work will concentrate on carbonyls and multi-functional carbonyls produced by the reactions of alkanes, alkenes, and aromatic hydrocarbons. Additional work will investigate the reactions of aromatic hydrocarbons with OH, the formation of nitro-polycyclic aromatic hydrocarbons (PAHs), and the photooxidation of PAHs found in diesel fuel.

### **Expected Results**

This project will investigate the atmospherically important reactions of the first generation products of selected VOCs. It will address the critical gaps in our understanding of the chemistry of compounds important in the formation of ozone, such as aromatic compounds, carbonyls, and multifunctional carbonyls. Another area of investigation will be the atmospheric transformation of PAHs into the typically more carcinogenic nitro-PAHs. Lastly, the project will investigate the products formed from the gas-phase photooxidation of PAHs present in diesel fuel.

### **Significance to the Board**

The information gained in this project will improve our understanding of the processes involved in the formation of secondary pollutants that pose health risks and degrade California's visibility. The information will be used to improve the chemical mechanisms used in ARB's attainment modeling for the State Implementation Plan. These chemical mechanisms are also necessary for reactivity calculations, which are the basis for ARB's reactivity-based limits for aerosol coatings. Thus, the results of this project will support ARB's use of hydrocarbon reactivity in consumer product regulations.

**Contractor:**  
University of California, Riverside

**Contract Amount:**  
\$299,987

**Contract Period:**  
36 Months

**Cofunding:**  
The work in this contract is  
complementary to a National Science  
Foundation Grant No. ATM-9809852  
(end-date 11/30/01).

**Principal Investigators (PI):**  
Professor Roger Atkinson and Professor  
Janet Arey

**Basis for Indirect Cost Rate:**

The indirect cost rate of ten percent is a negotiated rate agreed to by the University of California campuses and the State.

**Past Experience with this Principal Investigator:**

The PIs have worked on several ARB-sponsored projects in the past and have always delivered quality results with a very reasonable budget.

**Prior Research Division Funding to University of California, Riverside**

Year	1999	1998	1997
Funding	\$29,956	\$278,580	\$433,457

**BUDGET SUMMARY**

University of California, Riverside

Studies of the Atmospheric Chemistry of Volatile Organic Compounds and of their  
Atmospheric Reaction Products**DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$231,409
2.	Subcontractors	\$ 0
3.	Equipment	\$ 0
4.	Travel and Subsistence	\$ 4,500
5.	Electronic Data Processing	\$ 0
6.	Reproduction/Publication	\$ 3,000
7.	Mail and Phone	\$ 0
8.	Supplies	\$ 29,185 <sup>(1)</sup>
9.	Analyses	\$ 0
10.	Miscellaneous	<u>\$ 5,550</u>

Total Direct Costs

**\$273,644****INDIRECT COSTS**

1.	Overhead	\$ 26,343
2.	General and Administrative Expenses	\$ 0
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	<u>\$ 0</u>

Total Indirect Costs

**\$ 26,343****TOTAL PROJECT COSTS****\$299,987**

<sup>(1)</sup> Compressed Gases	\$ 4,500
Liquid Nitrogen	4,500
Chemicals	3,000
Teflon Film	2,185
Maintenance of FTIR, APF-MS, and GC's	<u>15,000</u>
	<b>\$29,185</b>

**PROPOSED****State of California  
AIR RESOURCES BOARD****RESEARCH PROPOSAL****Economic Value of Hospitalizations Associated with Particulate and Ozone Air Pollution**

Resolution 00-25  
June 22, 2000

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2451-214, entitled "Economic Value of Hospitalizations Associated with Particulate and Ozone Air Pollution," has been submitted by San Diego State University Foundation;

**WHEREAS**, the Research Division staff have reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2451-214 entitled "Economic Value of Hospitalizations Associated with Particulate and Ozone Air Pollution," submitted by San Diego State University Foundation, for a total amount not to exceed \$284,230.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2451-214 entitled "Economic Value of Hospitalizations Associated with Particulate and Ozone Air Pollution," submitted by San Diego State University Foundation, for a total amount not to exceed \$284,230.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed \$284,230.

## **Economic Value of Hospitalizations Associated with Particulate and Ozone Air Pollution**

### **Background**

A recent study by Kaiser Permanente indicates that increases in daily levels of ozone and fine particle pollution are closely correlated with increases in the number of people admitted to hospitals for air pollution-related illness. Currently, there are no willingness to pay (WTP) estimates, the amount an individual would be "willing to pay" to eliminate or reduce a hazard, for air pollution-related hospitalizations from any U.S. study. Previous health benefit analyses have estimated cost-of-illness (COI) values for hospitalizations, based on medical costs and work loss during the hospitalization period. Hospitalizations in these categories (cardiovascular and respiratory) represent very serious, and in some cases, life-altering health events. However, no accounting has been made for costs that may be incurred before or after hospitalization or that may have an effect on the patients' quality of life. The economic significance of reducing these events, in terms of the monetary value of the total effect on the well being of the affected individuals, is understated. Additionally, previous WTP studies did not focus on the patient's perception of the impacts air pollution-related illness had on their well being; therefore, estimates may be biased. These shortcomings have not been previously addressed empirically with the patient population.

### **Objective**

The objective of this study is to estimate the economic value of hospitalizations and doctor visits that have been linked to particulate matter and ozone air pollution exposures, using both the COI and WTP estimation methods.

### **Expected Results**

The results of this study will include estimates of direct medical costs for hospitalizations and clinic visits that are associated with air pollution, and the direct and indirect costs to patients who have experienced hospitalizations. It will also include the patients' WTP estimate to avoid future similar health events.

### **Significance to the Board**

Results from this study will be particularly valuable when the Board is determining the date a new regulation will take effect or considering the advisability of variances for existing regulations. This study will extend both the empirical and methodological basis for economic benefit valuation of air quality control measures and increase ARB's ability to assess the benefits of reducing particulate and ozone exposure. It will also provide a very important input to ARB's benefit analysis and help ARB develop the in-house capability to perform benefit analyses in the future.

**Contractor:**  
San Diego State University Foundation

**Principal Investigator (PI):**  
Dr. Mark Thayer

**Contract Period:**  
24 Months

**Contract Amount:**  
\$284,230

**Cofunding:**  
None

**Basis for Indirect Cost Rate:**

San Diego State University Foundation's federally negotiated indirect cost rate for research project is 52 percent. However, the University agreed to reduce its rate to 25 percent in support of this project.

**Past Experience with this Principal Investigator:**

Dr. Mark Thayer was the PI for ARB Contract No. A2-088-32, "Development of Methods to Estimate the Benefits of Visibility Improvement" (Final Report, January 1985). Dr. Thayer conducted the study in a competent and professional manner.

**Prior Research Division Funding to San Diego State University Foundation**

Year	1999	1998	1997
Funding	\$0	\$0	\$0

## BUDGET SUMMARY

San Diego State University Foundation

Economic Value of Hospitalizations Associated with Particulate and Ozone Air Pollution

### DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 46,267	
2.	Subcontractors	\$ 206,644	(1)
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 1,552	
5.	Electronic Data Processing	\$ 1,000	
6.	Reproduction/Publication	\$ 0	
7.	Mail and Phone	\$ 650	
8.	Supplies	\$ 2,000	
9.	Analyses	\$ 0	
10.	Miscellaneous	<u>\$ 0</u>	
	Total Direct Costs		\$258,113

### INDIRECT COSTS

1.	Overhead	\$ 26,117	
2.	General and Administrative Expenses	\$ 0	
3.	Other Indirect Costs	\$ 0	
4.	Fee or Profit	<u>\$ 0</u>	
	Total Indirect Costs		\$ 26,117

### TOTAL PROJECT COSTS

\$284,230

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(1)	Subcontractors Budget	
	Labor and Fringe Benefits	\$164,119
	Supplies and Miscellaneous	21,369
	Indirect Costs	<u>21,156</u>
	Total	\$206,644

